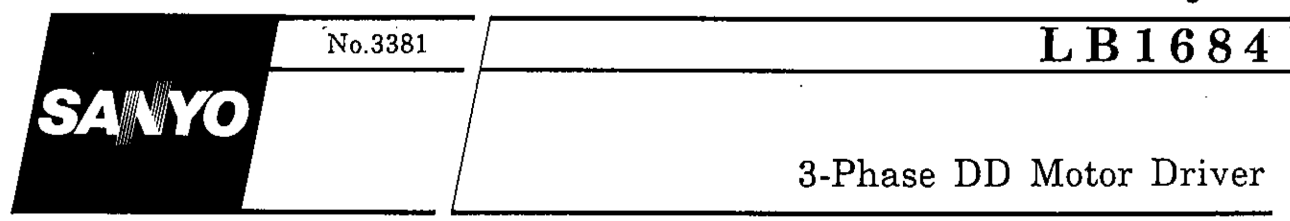
Ordering number: EN 3381

Monolithic Digital IC



The LB1684 is a 3-phase DD motor driver IC ideally suited for use in low-supply VTR capstan motor drive, drum motor drive, and floppy disk motor drive applications.

Features and Functions

- Designed for 5V-supply control system.
- Voltage-control system/current-control system available
- Speed control available
- Bidirectional control available
- 20V/1.5A rating

Absolute Maximum Ratings at Ta = 25°C

			unit
Maximum Supply Voltage	$V_{CC}1$	22	V
	$V_{CC}2$	7	V
Output Current	I_O	1.5	A
Allowable Power Dissipation	Pd max	2.2	W
Operating Temperature	Topr	−20 to +75	°C
Storage Temperature	Tstg	−55 to +125	°C

Allowable Operating Conditions at Ta = 25°C

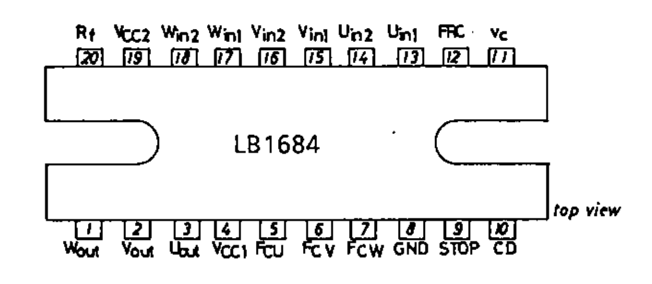
			unit
Supply Voltage	$V_{CC}1$	7.0 to 20	V
	$V_{CC}2$	4.3 to 6.3	V

Electrical Characteristics at Ta = 25°C, $V_{CC}1$ = 12V, $V_{CC}2$ = 5.0V

			min	typ	max	unit
Supply Current	I_{CC}(off)	V_C = 0V, $I_{CC}1 + I_{CC}2$		13	18	mA
	I_{CC}(dri)	V_C = 4V, $I_{CC}2$		20	40	mA
Output Saturation Voltage	V_O(sat)1	I_{OUT} = 0.58A sink + source		1.4	2.1	V
	V_O(sat)2	I_{OUT} = 1A sink + source		2.0	3.5	V
Common-Mode Input Voltage Range			1.3		$V_{CC}2 - 1.3$	V

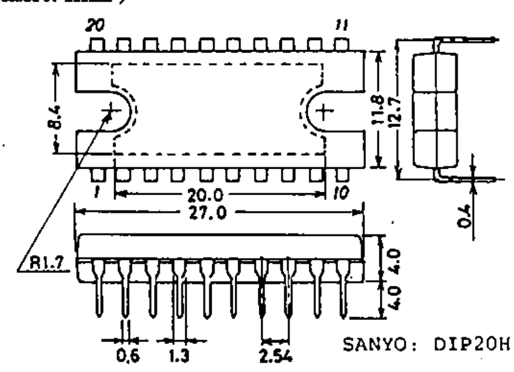
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Pin Assignment



Package Dimensions 3037A-D20HIC

(unit: mm)

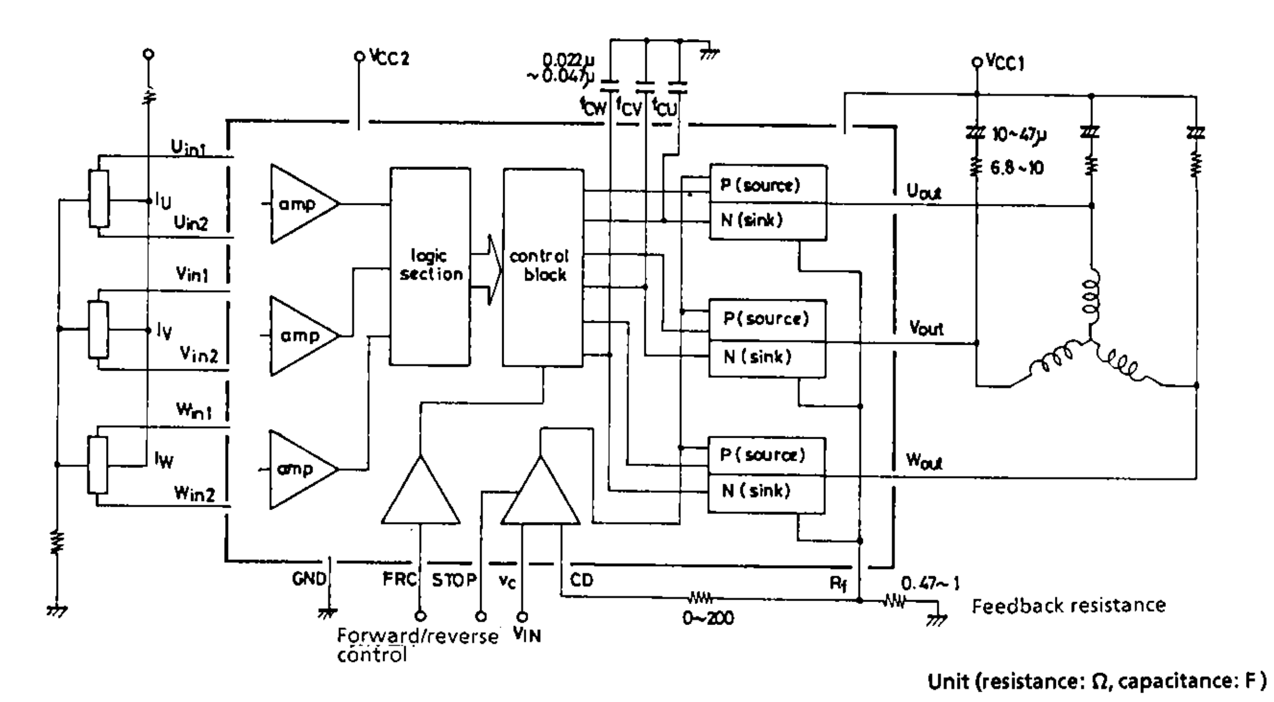


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			min	typ	max	unit
Motor Forward Rotation Input Voltage Range			2.0		$V_{CC}2$	V
Motor Reverse Rotation Input Voltage Range			0		0.3	V
Interphase Current Variation		Driver stage	−25	0	+25	%
		Output stage	−25	0	+25	%
Speed Control Voltage (OFF)	V_C1	$R_f=0, R_s=0$, FC pin → GND current 5μA			2.1	V
Speed Control Voltage (ON)	V_C2	$R_f=0, R_s=0$, FC pin → GND current 0.5mA	2.38		2.58	V
	V_C3	$R_f=1\Omega, R_s=100\Omega, V_Rf=100mV$		2.7		V
Closed-Loop Voltage Gain		$R_f=1\Omega, R_s=100\Omega, I_L=100mA$		0.44		A/V
Input Sensitivity		Hall input		20		mVpeak

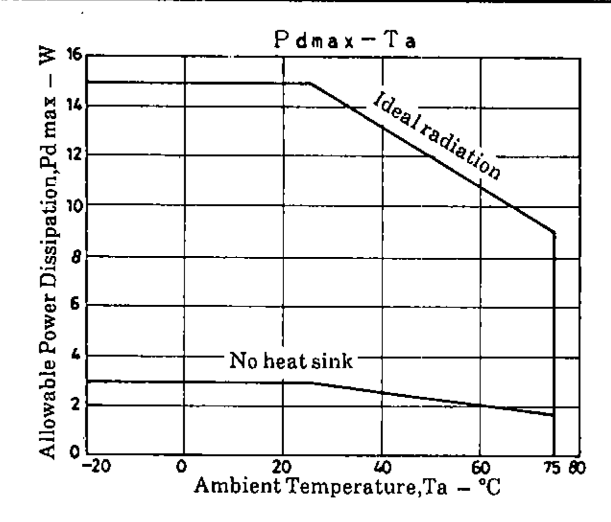
Equivalent Circuit Block Diagram and Peripheral Circuit



Unit (resistance: Ω, capacitance: F)

Truth Table

	Source → Sink			Input U	Input V	Input W	Forward/Reverse Control F/RC
1	W phase	→	V phase	H	H	L	L
	V phase	→	W phase				H
2	W phase	→	U phase	H	L	L	L
	U phase	→	W phase				H
3	V phase	→	W phase	L	L	H	L
	W phase	→	V phase				H
4	U phase	→	V phase	L	H	L	L
	V phase	→	U phase				H
5	V phase	→	U phase	H	L	H	L
	U phase	→	V phase				H
6	U phase	→	W phase	L	H	H	L
	W phase	→	U phase				H



Pin Description

Pin Name	Pin No.	Description
$U_{IN}1$, $U_{IN}2$ $V_{IN}1$, $V_{IN}2$ $W_{IN}1$, $W_{IN}2$	13, 14 15, 16 17, 18	U phase hall element input pin. 'H' of logic : $V_{IN}1 > V_{IN}2$ V phase hall element input pin. 'H' of logic : $V_{IN}1 > V_{IN}2$ W phase hall element input pin. 'H' of logic : $V_{IN}1 > V_{IN}2$
U_{OUT} V_{OUT} W_{OUT}	3 2 1	U phase output pin V phase output pin W phase output pin
$V_{CC}1$	4	Power supply pin for applying output
$V_{CC}2$	19	Power supply pin for applying voltage to each section other than output section. The control point of control voltage is at approximately 1/2 of this voltage. This voltage must be stabilized to be free from ripple, noise, etc.
R_f	20	Output current detect pin. By connecting R_f across this pin and GND pin, output current is detected as voltage.
C_D	10	Pin for fetching current (voltage) detected with R_f. By connecting a resistor across C_D pin and R_f pin, speed control start voltage can be fine-adjusted.
STOP	9	Overcurrent protection pin. Voltage being lower than that on C_D pin is taken to be identical to overcurrent flow, causing output to be cut off. For example, if STOP pin is set to 1.5V for $R_f = 1\Omega$, approximately 1.5A or more flows at output, causing output to be cut off.
F_{CU} F_{CV} F_{CW}	5 6 7	Frequency characteristic compensation pin. Closed-loop oscillation in current-controlled system (including motor, F-V converter) is stopped.
V_C	11	Speed/phase control pin. Control starts at approximately 1/2 of $V_{CC}2$. Control is of current-controlled type that controls output current. For $R_f = 1\Omega$, LB1684 closed-loop has gm = 0.44A/V typ, which can be adjusted by varying R_f.
GND	8	GND for other than output. Minimum potential of output transistor is at R_f pin.
F/R	12	Forward/reverse control pin. By setting this pin to 'H' (more than 2.0V)/'L' (less than 0.3V), truth value is changed to perform forward/reverse rotation.